BR SERIES
VALVED DTH HAMMERS

Service Manual

MADE IN BRITAIN

ISOQAR REGISTERED

UKAS MANAGEMENT SYSTEMS 0026

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ALWAYS THINK

SAFETY FIRST!

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1. INTRODUCTION

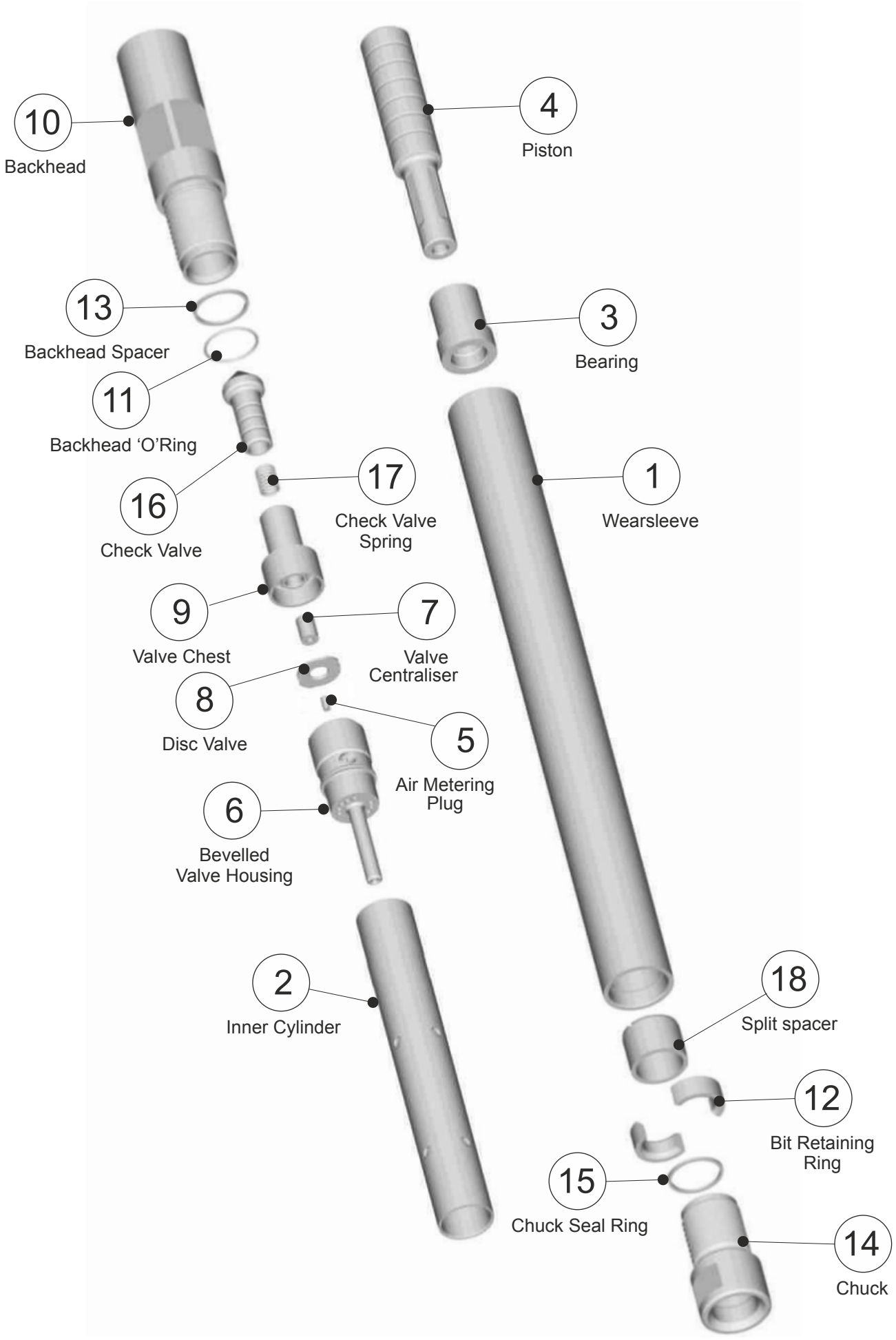
BULROC Valved D.T.H. hammers are robust tools of simple design to provide for maximum performance with the minimum of maintenance.

BULROC Valved hammers are designed to operate efficiently at air pressures, between 100 psi (7 BAR) and 250 psi (17.5 BAR), using a wide range of Button Bit diameters, from Ø60mm (BR1) through to Ø127mm (BR4).

BULROC Valved hammers are supplied with a Check Valve arrangement which maintains pressure in the hammer when the air has been shut off, and so helps prevent contaminated water entering the hammer.

BULROC Valved hammers are fitted with an Air Metering Plug. This is supplied as a solid plug, but can be drilled out to a selection of hole sizes in order to increase the volume of flushing air, if excess compressed air is available. This is to suit particular drilling conditions.

2. HAMMER COMPONENTS



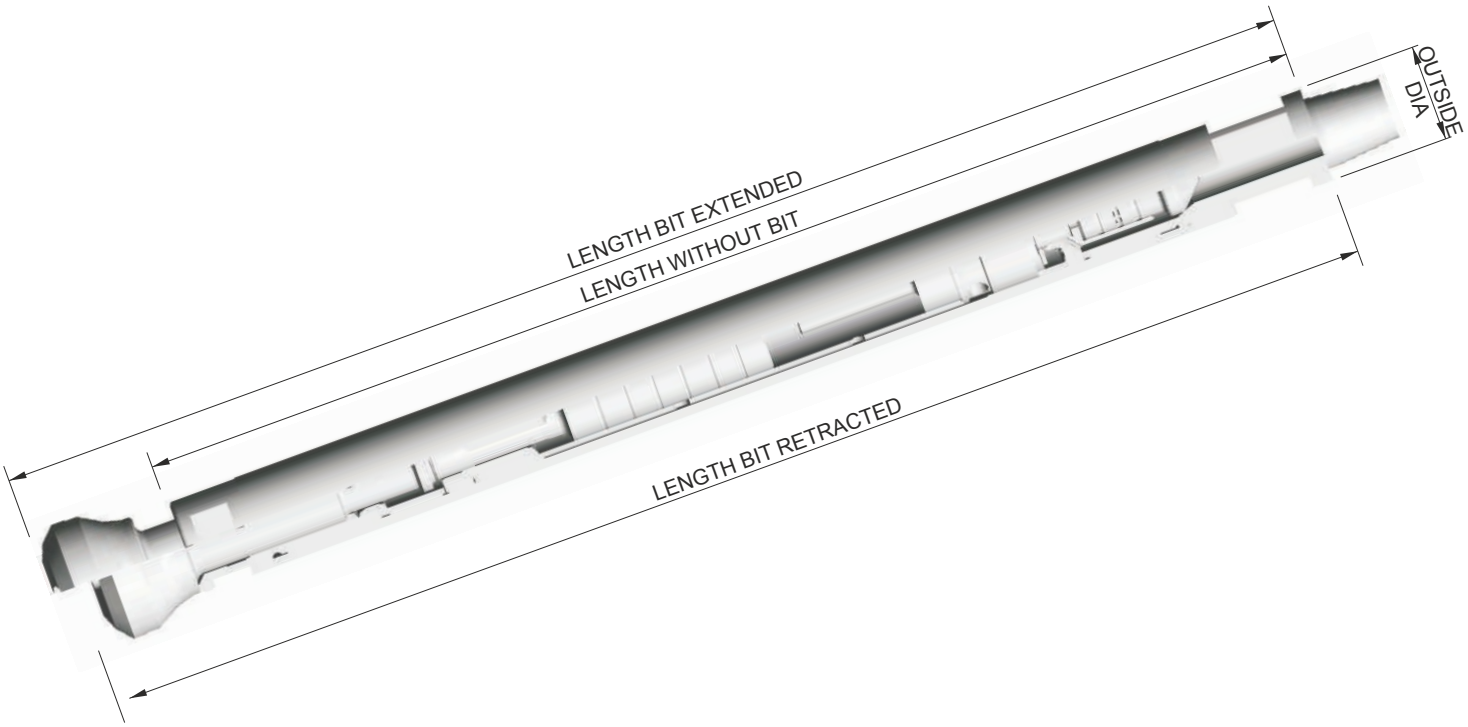
3. HAMMER PARTS LIST

REF	DESCRIPTION	BR1	BR2	BR3	BR33	BR4
1	WEARSLEEVE	HSB1S00	HSB2S00	HSB3S00	HSB3300	HSB4S00
2	INNER CYLINDER	HSB1S01	HSB2S01	HSB3S01	HSB3301	HSB4S01
3	BEARING	HSB1S02	HSB2S02	HSB3S02	HSB3302	HSB4S02
4	PISTON	HSB1S03	HSB2S03	HSB3S03	HSB3303	HSB4S03
5	AIR METERING PLUG	IPP04	IPP04	IPP03	IPP03	HSB4S11
6	BEVELLED VALVE HOUSING	HSB1S04	HSB2S04	HSB3S04	HSB3304	HSB4S04
7	CENTRALISER	HSB1S05	HSB2S05	IPC1	IPC1	HSB4S05
8	DISC VALVE	HSB1S06	HSB2S06	IPCDV1	IPCDV1	HSB4S06
9	VALVE CHEST	HSB1S07	HSB2S07	HSB3S07	HSB3307	HSB4S07
10	BACKHEAD	RD40 BOX HSB1S3810F	RD50 BOX HSB2S3811F	2 3/8" REG PIN HSB333801M	2 3/8" REG PIN HSB333801M	2 3/8" REG PIN HSB4S3811M
11	BACKHEAD "O" RING	IPB0R06	HSB2S14	IPB0R01	IPB0R01	IPB0R02
12	BIT RETAINER	IPBR03	HSB2S37ST	HSB3S37ST	HSB3337018	HSB4S37ST
13	BACKHEAD SPACER	IPBS05	HSB2S12	HSB3S12	IPBS04	IPBS01
14	CHUCK	HSB1S35ST	HSB2S35ST	HSB3S35ST	HSBB3335018	HSB4S35ST
15	CHUCK SEAL	IPC05	HSB2S13	HSB3S13	IPBS01	IPCS02
16	CHECK VALVE	IPCV06	IPRCV01	IPRCV01	IPRCV01	IPRCV02
17	CHECK VALVE SPRING	IPCVS05	IPRCVS01	IPRCVS01	IPRCVS01	IPRCVS02
18	SPLIT SPACER	IPSS07	HSB2S36ST	HSB3S36ST	HSB3336ST	HSB4S36ST

ALTERNATIVE BACKEAD CONNECTIONS						
	RD40 PIN	HSB1S3810M				
	AW BOX	HSB1S381F				
	WHTT BOX	HSB1S3816F	HSB2S3816F	HSB3S3816F		
	RD40 BOX		HSB2S3810F			
	WHTT PIN		HSB2S3816M	HSB3S3816M		
	RD50 BOX		HSB2S3811F	HSB3S811F	HSB333811F	HSB4S3811F
	REG 2¾ BOX			HSB3S3801F	HSB333801F	HSB4S3801F
	HOLMAN 2¾ BOX		HSB2S3813F	HSB3S813F	HSB333813F	HSB4S3813F

** Due to continual product improvement, specifications may be subject to change without notice.*

4. HAMMER SPECIFICATIONS



		BR1	BR2	BR3	BR33	BR4
Complete weight without bit	kg.	8	13	22	25	34.6
	lb.	17.6	28.6	48.5	55	76
Length without bit	mm.	709	838	768	768	913
	ins	27.9	33	30.2	30.2	35.9
Length bit extended	mm.	785	913	888	888	1090
	ins	30.9	36	34.9	34.9	42.9
Length bit retracted	mm.	760	889	830	830	1019
	ins	29.9	35	32.7	32.7	40.1
Outside diameter of hammer	mm.	51	62	78	82	95
	ins	2	2.44	3.07	3.22	3.75
Bore diameter	mm.	36	42.6	50.8	57.1	68
	ins	1.43	1.68	2	2.25	2.68
Piston stroke	mm.	76	102	102	102	102
	ins	3	4	4	4	4
Piston weight	kg.	1	1.8	2.5	3.3	4.6
	lb.	2.2	4	5.5	7.3	10.1

5. AIR CONSUMPTION FIGURES

IN CFM & (M^3/min)

MODEL	CHOKE SIZE	100 = 7		150 = 10.5		200 = 14		250 = 17.5	
		PSI	BAR	PSI	BAR	PSI	BAR	PSI	BAR
BR1	BLANK	17.79	(0.50)	32.69	(0.93)	50.32	(1.43)	70.33	(1.99)
	1/8”	43.79	(1.24)	70	(1.98)	99	(2.80)	130.33	(3.69)
BR2	BLANK	26.65	(0.75)	48.96	(1.39)	75.38	(2.13)	105.35	(2.98)
	1/8”	52.65	(1.49)	86.26	(2.44)	124.08	(3.51)	165.35	(4.68)
	3/16”	78.05	(2.11)	123.96	(3.51)	173.38	(4.91)	225.95	(6.39)
BR3	BLANK	38.33	(1.09)	70.42	(1.99)	108.41	(3.07)	151.51	(4.29)
	1/8”	64.33	(1.82)	107.72	(3.05)	157.11	(4.45)	211.51	(5.99)
	3/16”	90.33	(2.56)	145.42	(4.12)	206.41	(5.84)	272.11	(7.70)
	7/32”	116.33	(3.29)	182.92	(5.18)	255.41	(7.23)	332.41	(9.41)
BR33	BLANK	53.86	(1.53)	98.95	(2.80)	152.34	(4.31)	212.9	(6.03)
	1/8”	79.86	(2.26)	136.25	(3.86)	201.04	(5.69)	272.9	(7.73)
	3/16”	105.86	(2.99)	173.95	(4.92)	250.34	(7.08)	333.5	(9.44)
	7/32”	131.86	3.73)	211.45	(5.98)	299.34	(8.47)	393.8	(11.14)
BR4	BLANK	67.04	(1.9)	123.15	(3.49)	189.61	(5.37)	264.98	(7.5)
	1/8”	93.04	(2.63)	160.45	(4.54)	238.31	(6.75)	324.98	(9.20)
	3/16”	119.04	(3.37)	198.15	(5.61)	287.61	(8.14)	385.58	(10.91)
	1/4”	171.04	(4.84)	273.15	(7.73)	385.61	(10.91)	505.98	(14.32)

6. GENERAL MAINTENANCE

In normal dry drilling conditions, it is advisable to dismantle and check all hammer components every 250 hours of operation.

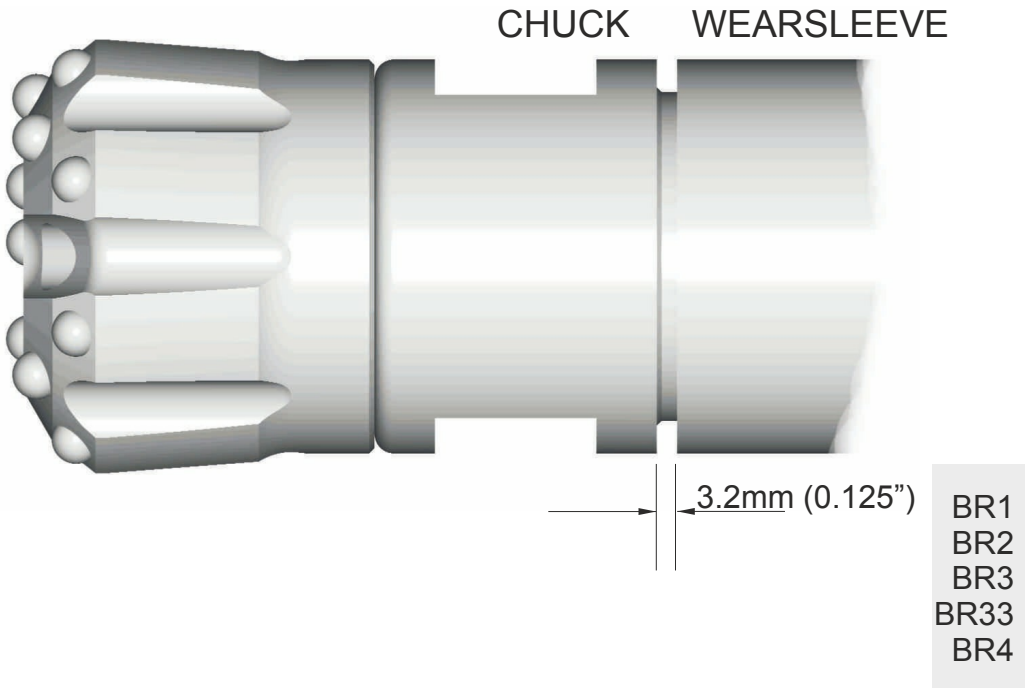
If a part is to be replaced because of irreparable damage or ultimate wear, then that part must be scrapped to ensure it is not put back into further use. This would seriously accelerate wear of certain other components.

1. When new, all BULROC Valved D.T.H. hammers will have a gap between the Chuck and the Wearsleeve. This is necessary to ensure that all the internal components are held securely in place.

This gap will gradually reduce during drilling and it is very important to check this gap approximately every 100 hours of operation.

When this gap reduces to 1.6mm (0.06) it is necessary to install the Backhead spacer. This is to be positioned between the Valve Chest and the Backhead.

To install the Backhead spacer loosen off the Chuck then remove the Backhead and place the Spacer on the Valve Chest. Now torque up the Backhead and tighten up the Chuck. You should now find that the Chuck gap has been restored to its original width.



2. Component checks on dismantled hammer

With the hammer dismantled into its component parts, check for lubrication starvation. The Piston especially will show heat cracks and eventually larger cracks if the hammer has been under lubricated or used with an incorrect type of lubricating oil. *(See page 11. for details.)*

3. Selective replacement

When the tolerance between the Piston Stem and the Bearing exceeds the values given in the table below, it is necessary to replace the Bearing. Similarly, when the tolerance between the Piston bore and the Valve Seat probe *(this is the protuberance over which the Piston head operates),* exceeds the limit, the Valve Seat should be replaced.

7. WEAR TOLERANCES

When the Piston and the Inner Cylinder exceed the values shown, either the Piston or the Inner Cylinder must be removed. In this case, do not scrap the replaced part as it can be returned to the hammer when the new partner is installed. In this way it is possible to double the life of both the Piston and the Inner Cylinder.

HAMMER	PISTON INNER CYLINDER	PISTON STEM BEARING	VALVE GUIDE PISTON BORE
BR1	0.008 ins. (0.20mm)	0.009 ins. (0.23mm)	0.010 ins. (0.25mm)
BR2	0.009 ins. (0.23mm)	0.009 ins. (0.23mm)	0.011 ins. (0.28mm)
BR3	0.010 ins. (0.25mm)	0.010 ins. (0.25mm)	0.012 ins. (0.30mm)
BR33	0.010 ins. (0.25mm)	0.010 ins. (0.25mm)	0.012 ins. (0.30mm)
BR4	0.011 ins. (0.28mm)	0.010 ins. (0.25mm)	0.012 ins. (0.30mm)

4.Valves

The hammer models BR1 through to BR4 use Disc Valves, which are of even thickness.. Check the Valves for cracks or pitting marks. By placing the Disc Valve on the bevelled valve housing and holding it in front of a light (or daylight) it is possible to conduct the 'light test'. That is, if light is discernible between the Valve and Valve Seat, turn it over and test the other side. If light is still discernible scrap the Valve. (Assuming that the bevelled valve housing is not faulty.)

5. Check the Valve Guide for score marks. If scored, clean with fine emery cloth.

6. Check the ends of the Cylinder for chipping, also the shoulder of the Bearing. Chipping in these areas indicates that the hammer has been run with the Chuck or Backhead (or both) in a loose condition. Failure to maintain the gap between the Chuck and Wearsleeve will also result in chipping and ultimate failure in the aforementioned areas.

7. Check the Non-return Valve located underneath the Back head. Depress it until it "bottoms" turning it slightly each time to ensure that it does not stick down. It is advisable to change the Check valve if its sealing capacity is in doubt. Check the Spring for breakage or weakness.

8. SELECTIVE REPLACEMENT

1. Mount the Wearsleeve into the vice and nip gently.

2. Push wad of clean rags through the bore.

3. Check bore of Wearsleeve for cleanliness and identify the end of the bore with the two eccentric grooves machined internally. The Split Spacer will be fitted to this, the Chuck end of the Wearsleeve.

4. Stand the Wearsleeve, Chuck end uppermost on a wooden block.

5. Insert compression tool into the end of the Wearsleeve and place Split Spacer into the compression tool.

6. Drive the Split Spacer through the compression tool, the chamfered end goes in first.

7. When the Split Spacer is clear of compression tool remove tool and drive Split Spacer into the Wearsleeve. Distance from Wearsleeve end face is (3 1/4" BR1), (3 1/4" BR2), (3" BR3), (3" BR33), (3 3/4"BR4)

8. Mount the Wearsleeve in the vice with Chuck end to the left.

9. Clean the Bearing and place wide end down on bench.

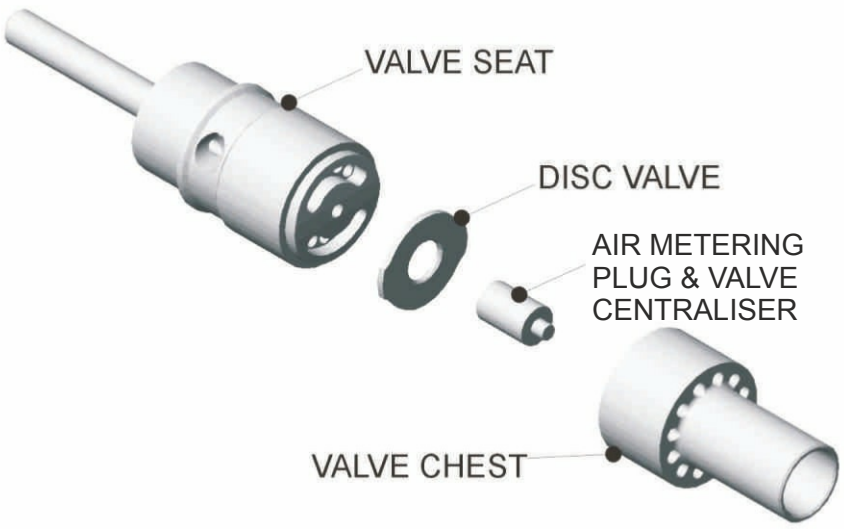
10. Oil the shank of Piston and stand the Piston inside the Bearing.

11. Clean the Cylinder. Identify the correct way up *(i.e. radiused end to the Bearing).*

12. Lower the Cylinder over the piston until it seats on the bearing shoulder.

13. Valve Assembly

The BR1, BR2, BR3, BR33 & BR4 models employ Disc Valves. Clean the Bevelled Valve Housing, the Valve Chest and Centralising Plug. Insert the Plug in its position in the Valve Chest. Clean the Disc Valve and oil it with a light oil. Locate it on the Centralising Plug Join the Valve Chest and Valve Housing with the Disc Valve in place.



9. REASSEMBLY PROCEDURE

14. Oil the guide on the bevelled valve housing and the smaller diameter of the Valve Seat itself. Insert the beveled valve housing into the end of the Cylinder.

15.Smear oil on all outside surfaces of Cylinder, bevelled valve housing and bearing.

16. Introduce the assembly to the wearsleeve. The assemblies for BR1 to BR4, will slide comfortably home with the Bearing butting upto the Split Spacer.

17. If a Backhead Spacer is to be fitted, it should be fitted at this stage.

18. Oil the Check Valve and fit into bore of Valve Chest. Push the Check Valve home and check that it does not stick by rotating and fully depressing it to the bottom of the bore in the Valve Chest.

19. Fit a seal to the groove at the base of the Backhead threads grease the threads and screw the Backhead fully home.

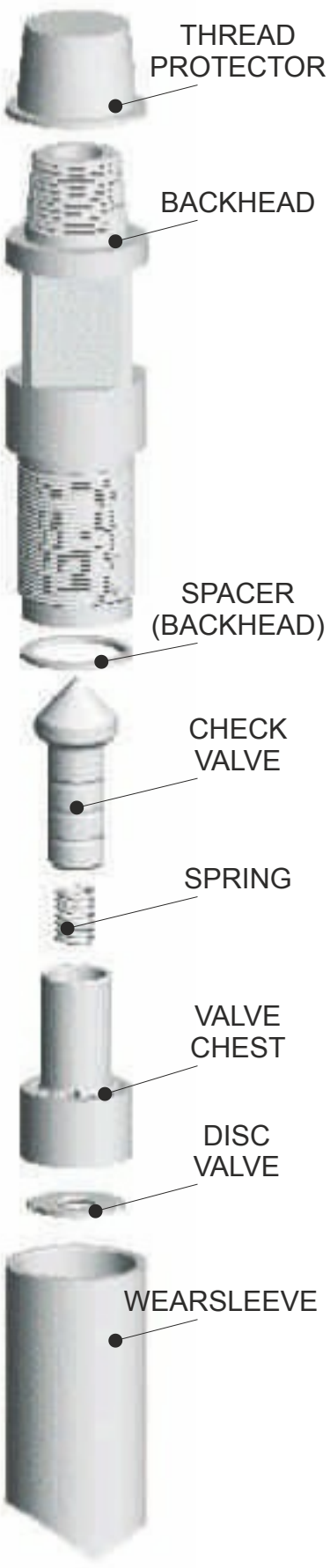
20. Fit the plastic thread protector over the Backhead threads.

21. Insert the Bit Retaining ring halves into the Chuck end of the Wearsleeve.

22. Apply grease to threads of Chuck and screw Chuck into Wearsleeve.

23. If a bit is to be fitted slip the Chuck over the Bit splines fit Retainers over plain portion of Bit Shank. Offer the Bit assembly to the Wearsleeve and screw home.

24. Air Metering plug where fitted this is a steel Allen headed type plug which is screwed into the bevelled valve housing..



10. LUBRICATION

Inadequate supply of the correct type of oil is a major contributor to excessive Component wear and consequently, a rapid fall off in performance. An air line lubrication should be installed, preferably on the drill rig. This should be of sufficient capacity to supply the required volume of oil for a full shift.

The lubrication must be adjustable and set to ensure the correct flow of oil required by the hammer The amount of lubricating oil will vary with the operating pressure and volume of air used by the hammer.
As a general guide, any BULROC Valved D.T.H. hammer will require 1/3rd of a pint per 100 CFM through the hammer (0.07 ltr. per 1.0 M^3/min per hour).

e.g. BR4 operating at 150 psi = 300 cfm = 1 pint per hour 10.5 Bar = 8.5 M^3/min
= 0.6 ltr. per hour

When drilling with foam or water, the amount of lubricating oil should be increased by 50%.

When new drill tubes are put into use, it is recommended that ½ a pint of oil (0.25 ltrs) be poured into each new tube to give them a good coating of oil and to prevent the hammer from running dry at any time.
Ambient temperatures will determine the grade of rock drill oil to be used. Should the ambient temperature be between OºC and 25ºC, use a 30 grade oil. When the ambient temperature is over 25ºC, use a 50 grade Oil. A selection of recommended rock drill oils suitable for BULROC Valved D.T.H. hammers is given below:

MAKE	TYPE 30 GRADE	TYPE 50 GRADE
BULROC	T220	T320
BP	ENERGOL RD-E 100	ENERGOL RD-E 300
CHEVRON	ARIES 100	ARIES 320
SHELL	TORCULA 100	TORCULA 320
ESSO/EXXON	AROX EP100	AROX EP320

VALVED HAMMER STORAGE PROCEDURE

We recommend following the points listed below when removing a 'Down hole hammer' from service. This will ensure trouble free operation once the hammer starts work again.

- The hammer should be stripped and cleaned and free of all water/moisture as possible.
- Bulroc T220 or similar rock drill oil should be poured into backhead (see chart below for quantity) allowing all parts to be coated throughout the hammer.
- Both ends of the hammer should be then covered to prevent the ingress of dirt, etc.
- It should be then laid horizontally in a dry environment ready for use next time.

Model	Qty in UK Pints	Qty in litre's
BR1 & 2	¼	0.14
BR3/33	¼	0.14
BR4	½	0.28

If this procedure is followed then apart from protecting the hammer from corrosion it will protect the parts from premature wear and of course reduce 'down time' and eventual repair costs. However we strongly recommend that the hammer, especially if stored for any long periods of time should be stripped, cleaned, inspected and re-oiled

11. TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
INOPERATIVE DRILL	Drill bit blowholes blocked	Unblock holes
	Dirt inside drill	Strip and clean drill
	Worn or damaged parts	Replace damaged parts
	Insufficient lubrication	Check oil level, adjust lube needle value
	Excessive lubrication	Adjust lube needle value
	Hanging Piston	Piston stuck. Polish out the score marks
	Insufficient air pressure	Check compressor discharge and increase to operational value
SLOW PENETRATION	Insufficient air pressure	Increase discharge pressure
	Dull drill bit	Re-grind or change bit
	Worn drill parts	Replace worn parts
	Too much or too little lubrication	Check oil level and if necessary adjust lube needle value
	Dirt in drill	Strip and clean
LOW RETURN AIR VELOCITY	Low air pressure	Increase air pressure
	Insufficient hole flushing air passing through metering plug	Insert metering plug with larger orifice or remove plug altogether
	Drill bit exhaust holes blocked	Clean out blockage
SPASMODIC OPERATION	Failed or damaged parts	Overhaul drill
	Lack of oil	Check lubrication
	Drill bit broken	Replace bit
	Dirt in drill	Strip and clean

NOTES:

For the full range of genuine Bulroc BR hammers, button bits and parts, contact Bulroc sales today on **+44 (0)1246 544700**, or email info@bulroc.com. Technical brochures and copies of this manual can be downloaded from our company website: **www.bulroc.com**

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Manufacturers of Rock Drilling Equipment

Turnoaks Business Park, Burley Close, Chesterfield ,Derbyshire S40 2UB
Tel: +44(0) 1246 544700 Fax: +44(0) 1246 544701
E-mail: info@bulroc.com website bulroc.com

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Bulroc [U.K.] LTD